DATA MODUL
DISPLAYS AND EMBEDDED SOLUTIONS

Specification

G121SN01 V4 incl. Touch - 4W

Content:

Mechanical Drawing

Appendix A: Specification of TFT G121SN01 V4

Appendix B: Specification of Touch AST-121A080A

Please be aware that some of the values e.g. optical, mechanical etc. of the complete unit (assembled display plus touch panel) might differ from the original values of the individual components.

Version: March 2013

Note: This specification is subject to change without prior notice

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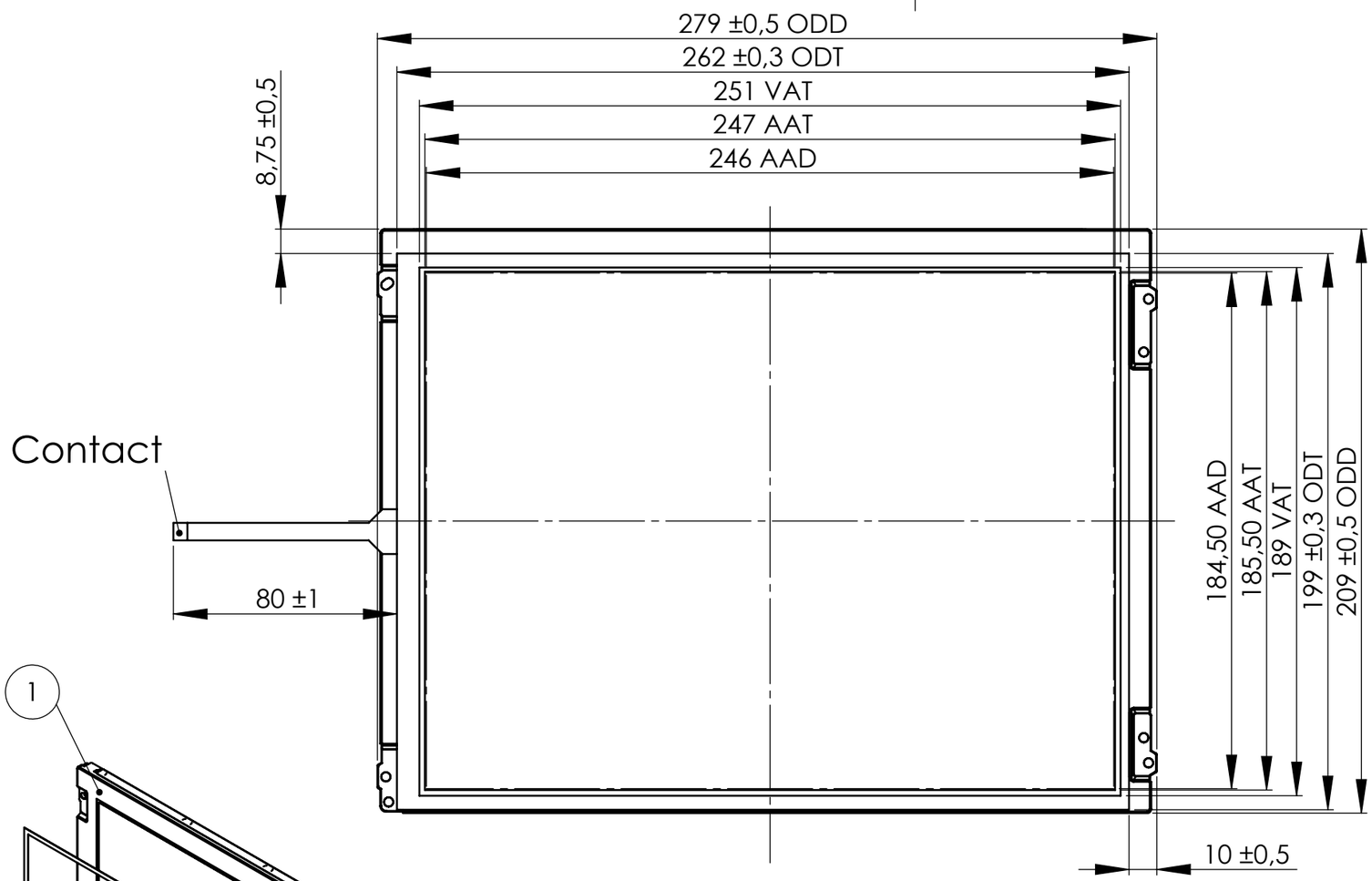

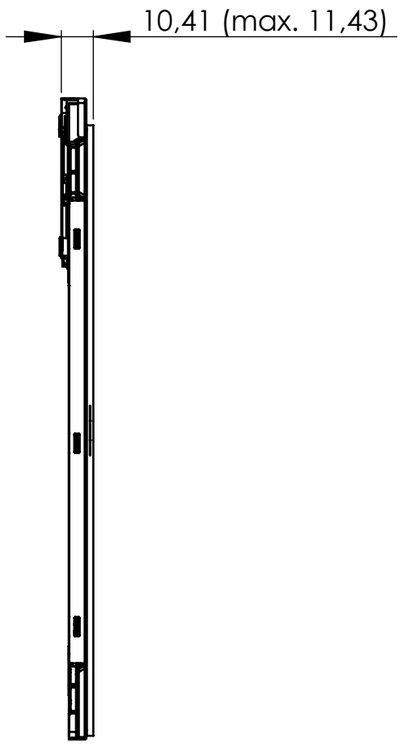

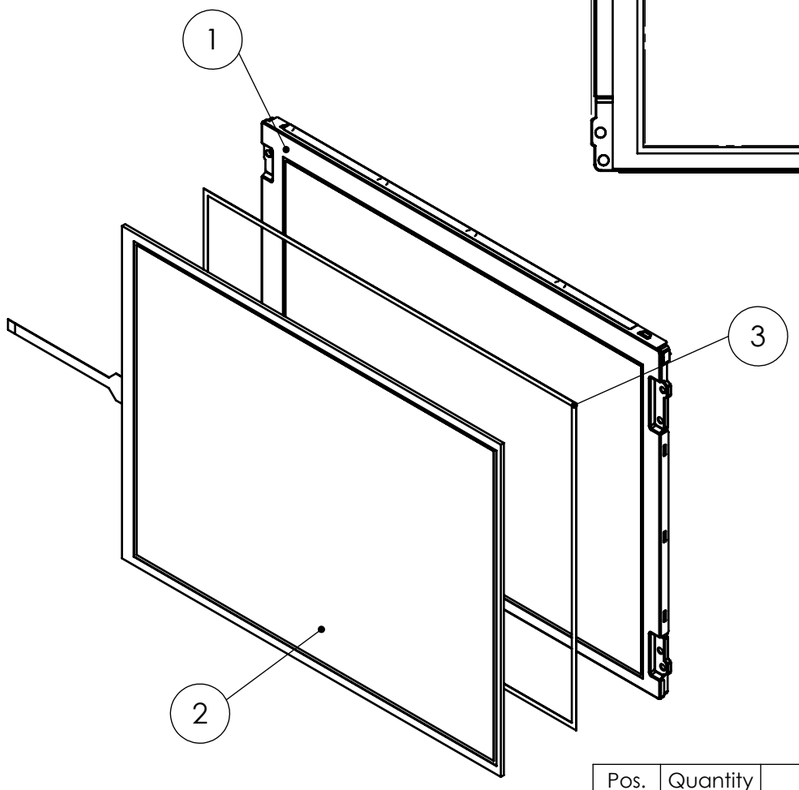

M 1:3

Pos.	Quantity	File Number	Description
1	1	1009935-T	TFT-LCD MODULE 12,1"
2	1	1009860-T	Touch
3	1	1009956-T	Klebeband 3x0,13

ODD	Outline Dimension Display
ODT	Outline Dimension Touch
VAT	Viewing Area Touch
AAT	Active Area Touch
AAD	Active Area Display

This drawing is only schematic representation of the structure.
The parts to be used are defined in the ProAlpha parts list.

REV.	NO. OF CHANGES	REL.DATE	DRAWN BY	E.C.-NO.	MODIFICATION/DESCRIPTION
000		26.02.2013	Aschenbrenner	10000	Neuanlage

FINISH

CONRAC D-97990 Weikersheim

DATA MODUL D-80687 München

RELEASED: ja

PROJECT: DMO_C_

MATERIAL

DRAWING TITLE

Assembly

TFT Display 12,1" + resistive Touch

TOLERANCES DIN ISO 2768-mK

SURFACES DIN ISO 1302

DRAWING/PART NUMBER

12002655 000

FILE NUMBER: 1009957

SCALE 1:2

SIZE ISO A3

( ) Preliminary Specifications
(V) Final Specifications

Module	12.1 Inch Color TFT-LCD
Model Name	G121SN01 V4

Customer	**Date**	**Approved by**	**Date**
		Leader Feng	2012/10/15
Checked & Approved by		**Prepared by**	
		Yichih Chen	2012/10/15
Note: This Specification is subject to change without notice.		General Display Business Division / AU Optronics corporation	

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Contents

1. Operating Precautions 4
2. General Description 5
2.1 Display Characteristics 5
2.2 Optical Characteristics 6
3. Functional Block Diagram 9
4. Absolute Maximum Ratings 10
4.1 Absolute Ratings of TFT LCD Module 10
4.2 Absolute Ratings of Environment 10
5. Electrical Characteristics 11
5.1 TFT LCD Module 11
5.2 Backlight Unit 13
6. Signal Characteristics 14
6.1 Pixel Format Image 14
6.2 Scanning Direction 14
6.3 TFT-LCD Interface Signal Description 15
6.4 The Input Data Format 16
6.5 TFT-LCD Interface Timing 17
6.6 Power ON/OFF Sequence 18
7. Connector & Pin Assignment 19
7.1 TFT-LCD Signal (CN1): LCD Connector 19
7.2 LED Backlight Unit (CN2): Backlight Connector 19
8. Reliability Test Criteria 20
9. Mechanical Characteristics 21
9.1 LCM Outline Dimension (Front View) 21
9.2 LCM Outline Dimension (Rear View)(Pin 1 position) 22
10. Label and Packaging 23
10.1 Shipping Label (on the rear side of TFT-LCD display) 23
10.2 Carton Package 23
11 Safety 24
11.1 Sharp Edge Requirements 24
11.2 Materials 24
11.3 Capacitors 24
11.4 National Test Lab Requirement 24

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Record of Revision

Version and Date	Page	Old description	New Description
0.0 2009/02/03	All	First Edition	
1.0 2009/05/14	6	Color / Chromaticity Coordinates(Red x y, Green x y, Blue x y): TBD	Add Min., Typ., Max.
	13	Parameter guideline for LED backlight	Add VF, IF, PLED
		Dimming Duty cycle Min: TBD	Dimming Duty cycle Min: 5
	19	Connector & Pin Assignment	Add LED Backlight Unit (CN4): Light bar Connector
	22	LCM Outline Dimension (Rear View)	Add CN4 drawing
	23	Label and Packaging	Add Shipping Label, Carton Package
1.1 2010/10/15	10		Add wet bulb chart
	13		Remove Irush LED
	18	Power ON/OFF Sequence: T3= 200ms	Power ON/OFF Sequence: T3= 175ms
1.2 2011/03/23	16		Add 8 Bit signal description
1.3 2011/08/30	21		Update Drawing,_add tolerance
1.4 2012/10/15	13		Add LED on/off voltage range $V_{LED\ On/Off}$ | On Control Voltage | 3.0 | -- | 5.5 | Volt Off Control Voltage | -- | 0 | 0.5 | Volt
	21		Add 2 user holes' coordinate dimension
	23		Correct model no. on shipping label

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1. Operating Precautions

1) Since front polarizer is easily damaged, please be cautious and not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
5) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.
6) To avoid ESD (Electro Static Discharde) damage, be sure to ground yourself before handling TFT-LCD Module.
7) Do not open nor modify the module assembly.
8) Do not press the reflector sheet at the back of the module to any direction.
9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED light bar edge. Instead, press at the far ends of the LED light bar edge softly. Otherwise the TFT Module may be damaged.
10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
13) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.
14) Continuous operating TFT-LCD display under low temperature environment may accelerate lamp exhaustion and reduce luminance dramatically.
15) The data on this specification sheet is applicable when LCD module is placed in landscape position.
16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.

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2. General Description

This specification applies to the Color Active Matrix Liquid Crystal Display G121SN01 V4 composed of a TFT-LCD display, a driver and power supply circuit, and a LED backlight system.

The screen format is intended to support SVGA (800(H) x 600(V)) screen and 16.2M (RGB 8-bits) or 262k colors (RGB 6-bits).

LED driving board for backlight unit is included in G121SN01 V4 and the LED unit is replaceable.

All input signals are LVDS interface and compatible with G121SN01 V3.

G121SN01 V4 designed with wide viewing angle; wide temperature and long life LED backlight is well suited for industial applications.

G121SN01 V4 is a RoHS product.

2.1 Display Characteristics

The following items are characteristics summary on the table under 25 □ condition:

Items	Unit	Specifications
Screen Diagonal	[inch]	12.1
Active Area	[mm]	246 (H) x 184.5 (V)
Pixels H x V		800 x 3(RGB) x 600
Pixel Pitch	[mm]	0.3075 x 0.3075
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	3.3 (typ.)
Typical Power Consumption	[Watt]	6.7 W All black pattern
Weight	[Grams]	580 (Max.)
Physical Size	[mm]	279.0(H) x 209.0(V) x 9.0(D) (Typ.)
Electrical Interface		1 channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.2M / 262K colors
Temperature Range Operating Storage (Non-Operating)	 [°C] [°C]	 -30 to +85 -30 to +85
RoHS Compliance		RoHS Compliance

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2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25□ (Room Temperature):

Item	Unit	Conditions	Min.	Typ.	Max.	Remark
White Luminance	[cd/m2]	I_F= 80mA/1 LED Line (center point)	330	450	-	Note 1
Uniformity	%	5 Points	75	-	-	Note 2, 3
Contrast Ratio			500	700	-	Note 4
Response Time	[msec]	Rising	-	25	35	Note 5
	[msec]	Falling	-	10	20	
	[msec]	Raising + Falling	-	35	55	
Viewing Angle	[degree] [degree]	Horizontal (Right) CR = 10 (Left)	70 70	80 80	- -	Note 6
	[degree] [degree]	Vertical (Upper) CR = 10 (Lower)	55 65	65 75	- -	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.556	0.606	0.656	
		Red y	0.300	0.350	0.405	
		Green x	0.254	0.304	0.354	
		Green y	0.527	0.577	0.627	
		Blue x	0.099	0.149	0.199	
		Blue y	0.077	0.127	0.177	
		White x	0.263	0.313	0.363	
		White y	0.279	0.329	0.379	
Color Gamut	%			55	-	

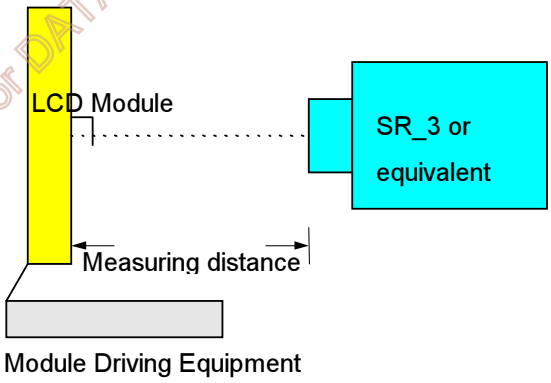
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

Aperture 1□with 50cm viewing distance

Test Point Center

Environment < 1 *lux*



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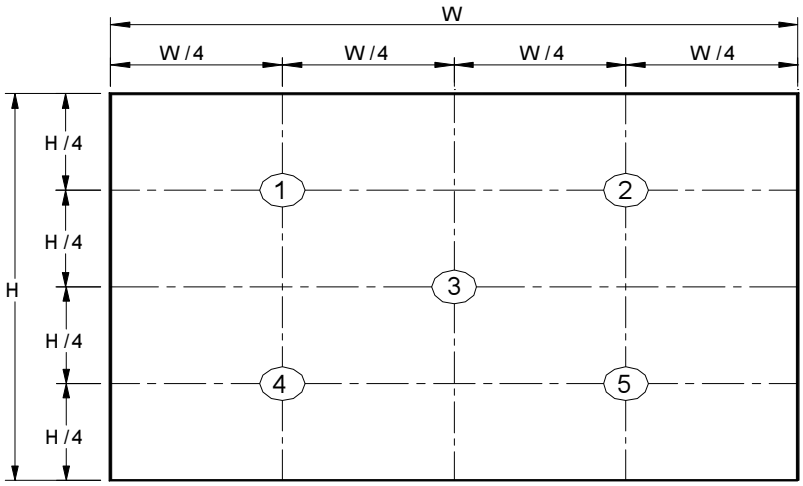
Note 2: Definition of 5 points position (Display active area: 246mm (H) x 184.5mm (V))



Note 3: The luminance uniformity of 5 points is defined by dividing the minimum luminance values by the maximum test point luminance

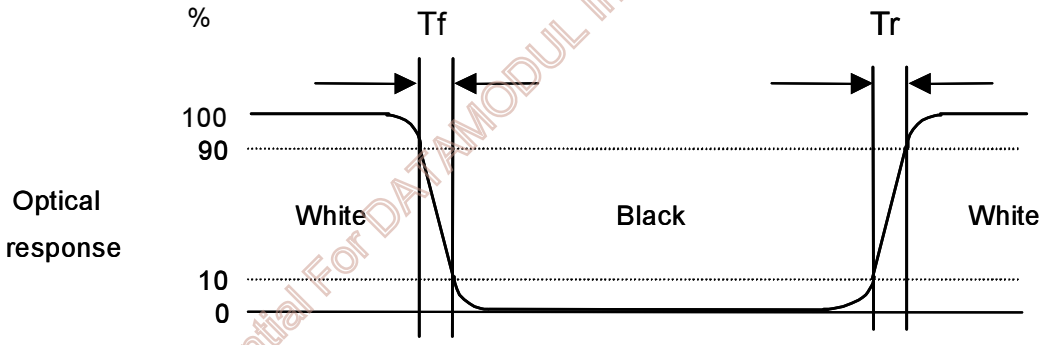
$$\delta_{W9} = \frac{\text{Minimum Brightness of five points}}{\text{Maximum Brightness of five points}}$$

Note 4: Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the “White” state}}{\text{Brightness on the “Black” state}}$$

Note 5: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “White” to “Black” (falling time) and from “Black” to “White” (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio □10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired

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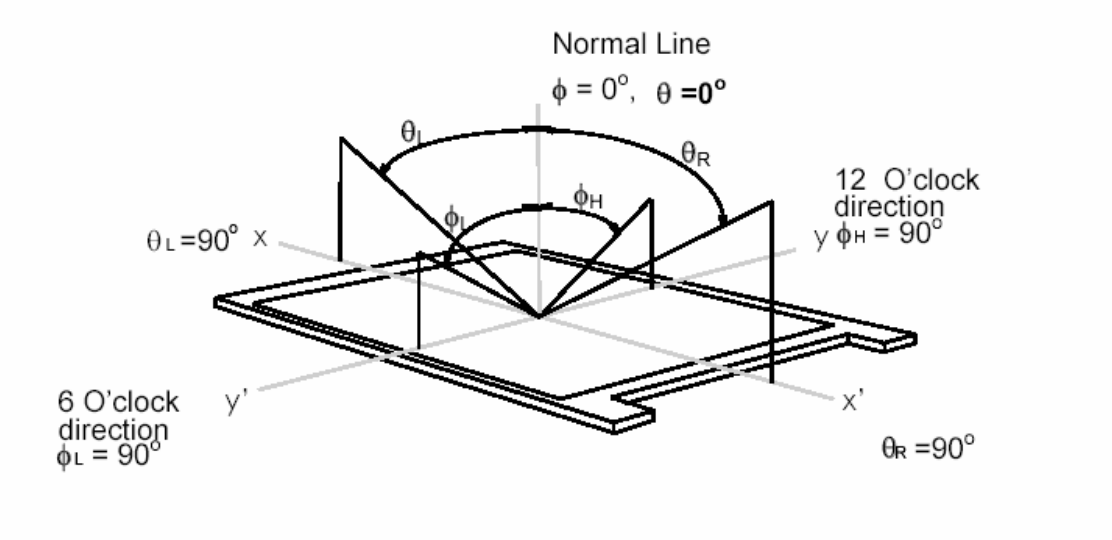
measurement viewing angle.



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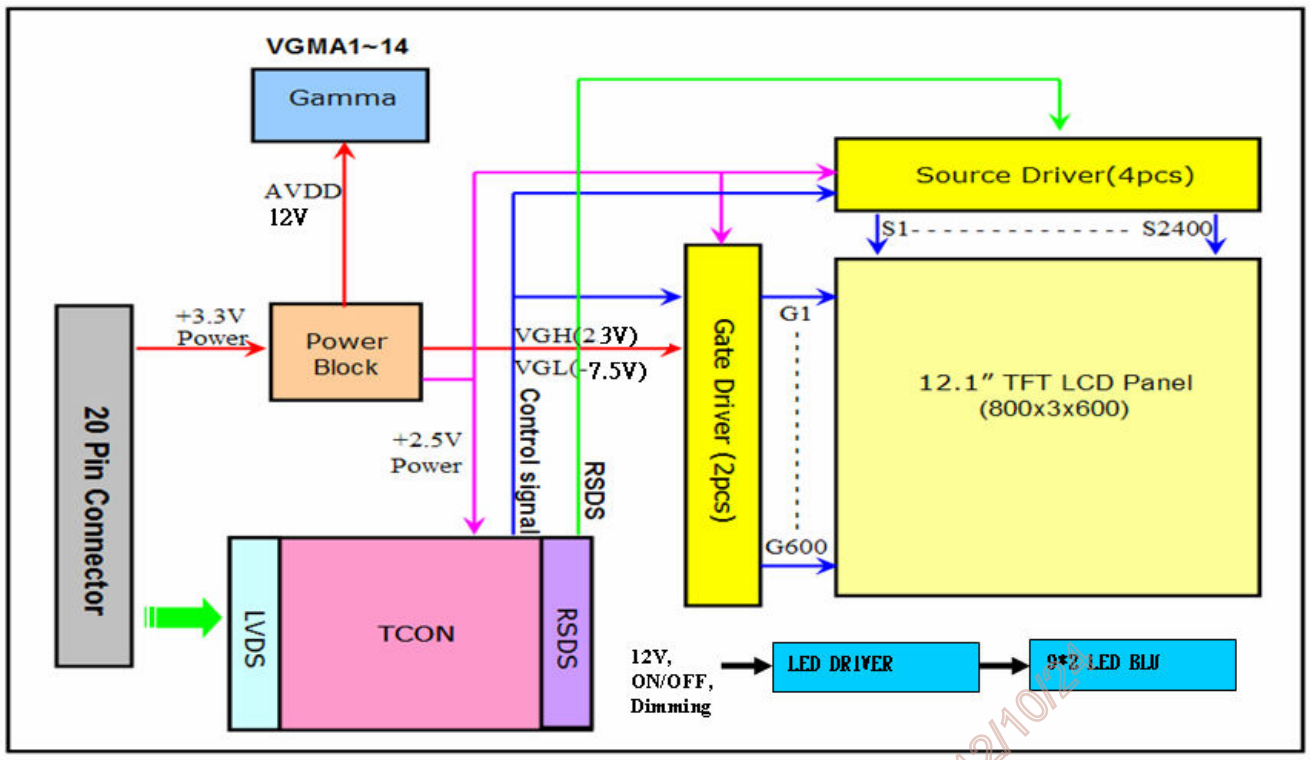
3. Functional Block Diagram

The following diagram shows the functional block of the 12.1 inch color TFT/LCD module:



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4. Absolute Maximum Ratings

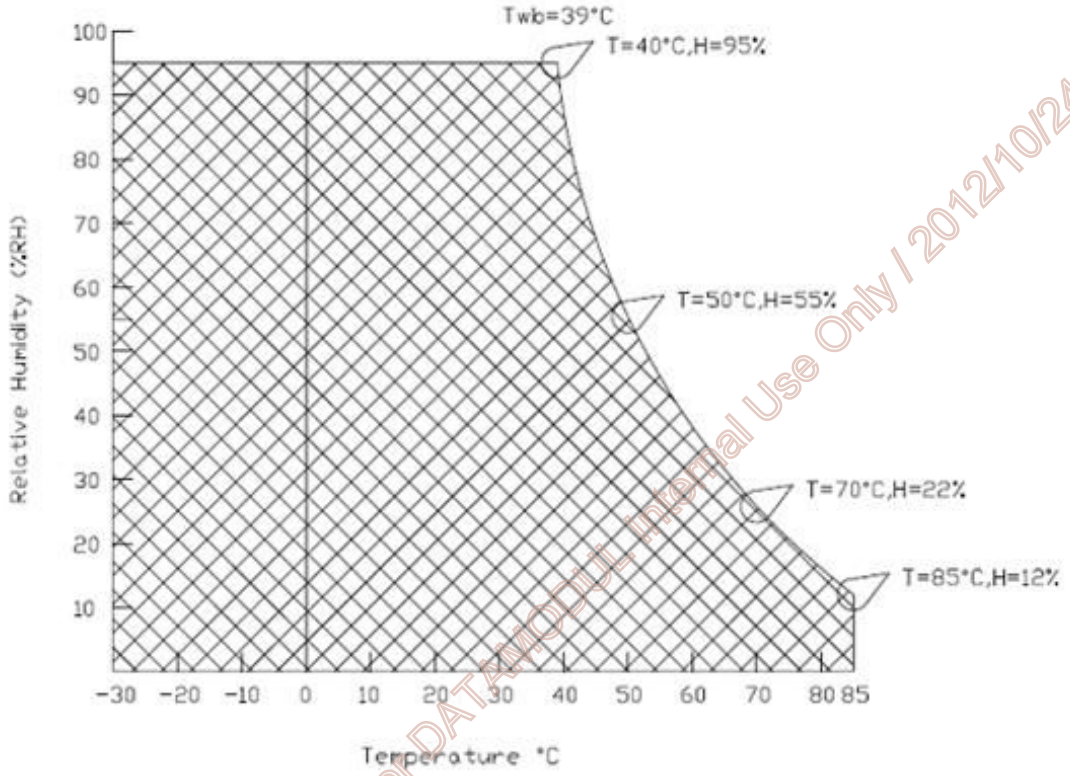
4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit
Logic/LCD Drive Voltage	Vin	-0.3	+3.6	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-30	+85	[°C]
Operation Humidity	HOP	5	95	[%RH]
Storage Temperature	TST	-30	+85	[°C]
Storage Humidity	HST	5	95	[%RH]

Note: Maximum Wet-Bulb should be 39□ and no condensation.



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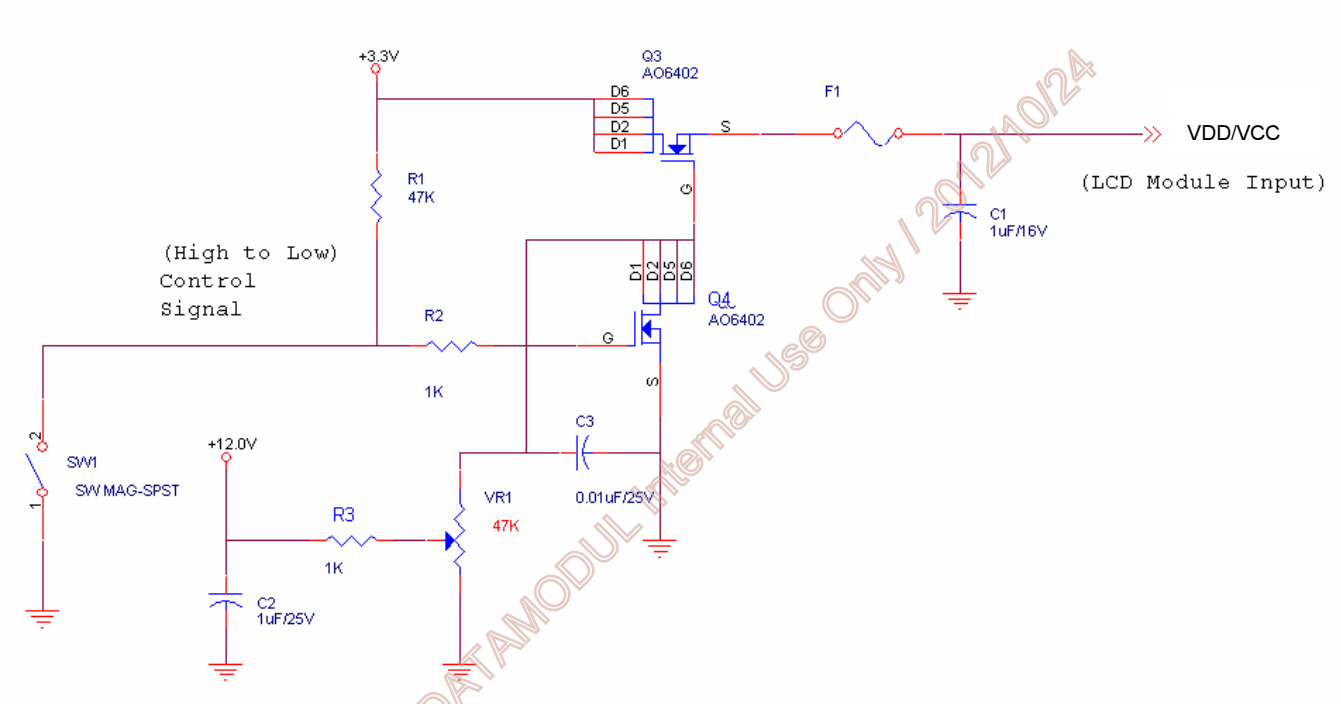
5. Electrical Characteristics

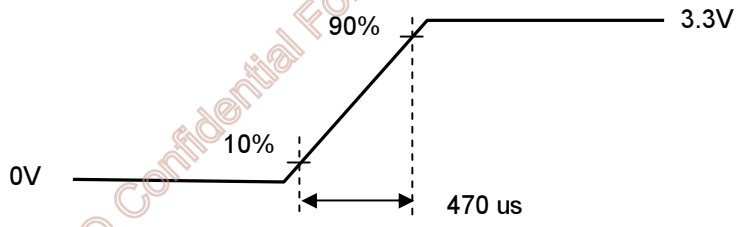
5.1 TFT LCD Module

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Input Voltage	3.0	3.3	3.6	[Volt]	
I_{VDD}	LCD Input Current	-	280	-	[mA]	VDD=3.3V at 60 HZ, all Black Pattern
P_{VDD}	LCD Power comsumption	-	0.924	-	[Watt]	VDD=3.3V at 60 HZ, all Black Pattern
$I_{rush\ LCD}$	LCD Inrush Current	-	-	1.5	[A]	Note 1; VDD=3.3V Black Pattern, Rising time≧470us
VDD_{rp}	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	VDD=3.3V at 60 HZ, all Black Pattern

Note 1: Measurement condition:





VDD rising time

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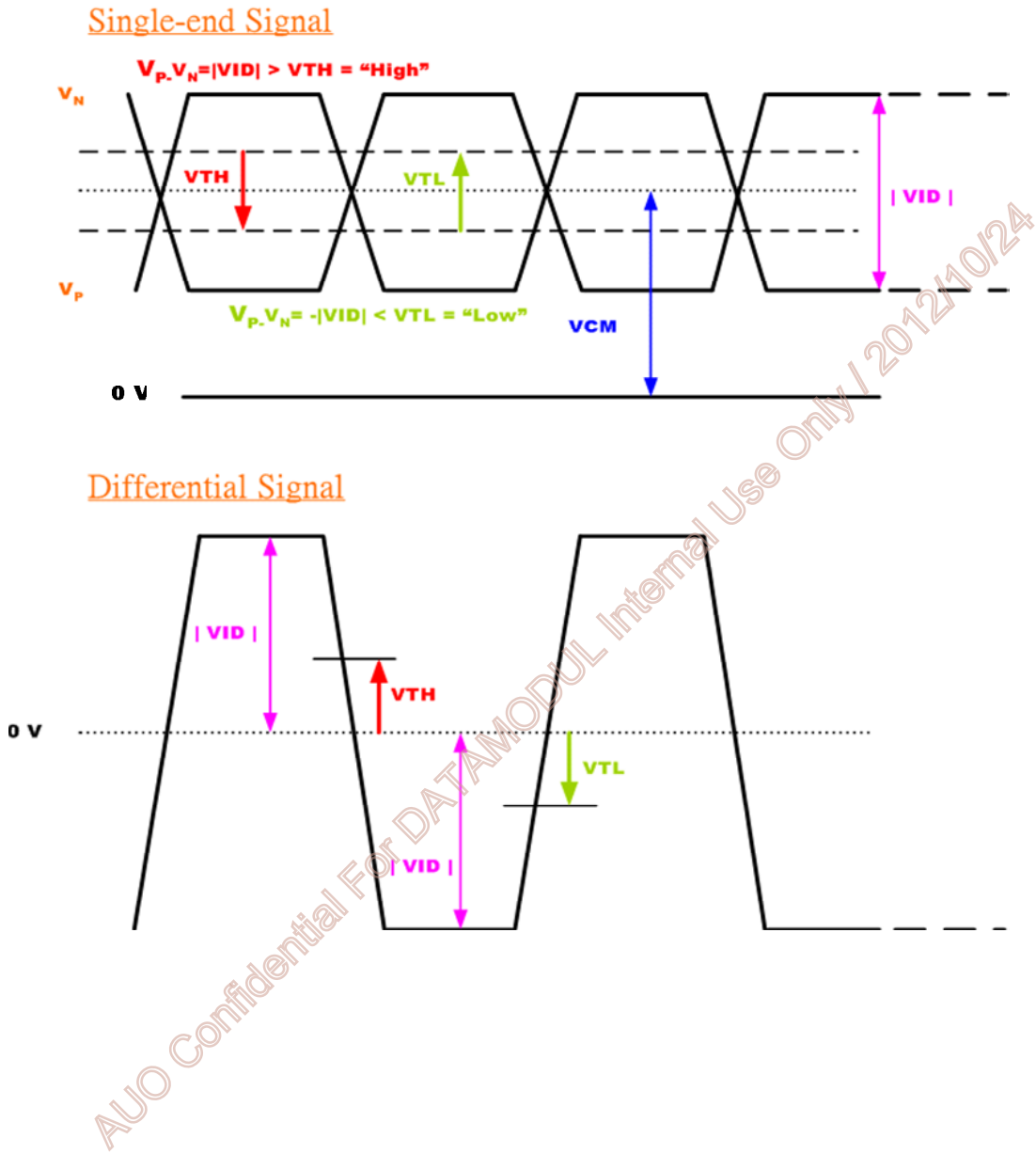
5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	-	-	100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	100	-	-	[mV]	VCM=1.2V
| VID |	Input Differential Voltage	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.1	-	1.45	[V]	VTH/VTL=+-100mV

Note: LVDS Signal Waveform.



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5.2 Backlight Unit

5.2.1 Parameter guideline for LCD

Following characteristics are measured under stable condition at 25□. (Room Temperature):

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
VCC	Input Voltage	10.8	12	12.6	[Volt]	
I_{VCC}	Input Current	-	0.48	-	[A]	100% PWM Duty
P_{VCC}	Power Consumption	-	5.76	6	[Watt]	100% PWM Duty
$V_{LED\ On/Off}$	On Control Voltage	3.0	-	5.5	Volt	
	Off Control Voltage	-	0	0.5	Volt	
F_{PWM}	Dimming Frequency	200	-	20K	[Hz]	
	Swing Voltage	3	3.3	5.5	[Volt]	
	Dimming duty cycle	5	-	100	%	
I_F	LED Forward Current	-	80	-	[mA]	Ta = 25°C
V_F	LED Forward Voltage	-	27.9	31.5	[Volt]	I_F = 80mA, Ta = -30°C
		-	28.8	32.9	[Volt]	I_F = 80mA, Ta = 25°C
		-	30.6	35.1	[Volt]	I_F = 80mA, Ta = 85°C
P_{LED}	LED Power Consumption	-	4.9	5.6	[Watt]	
Operation Life		50,000	-	-	Hrs	I_F=80mA, Ta= 25°C

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: VCC, I_{VCC}, P_{VCC} are defined for LED backlight.(100% duty of PWM dimming)

Note 3: I_F, V_F are defined for one channel LED. There are two LED channel in back light unit.

Note 4: If G121SN01 V4 module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 5: Operating life means brightness goes down to 50% initial brightness. Minimum operating life time is estimated data.

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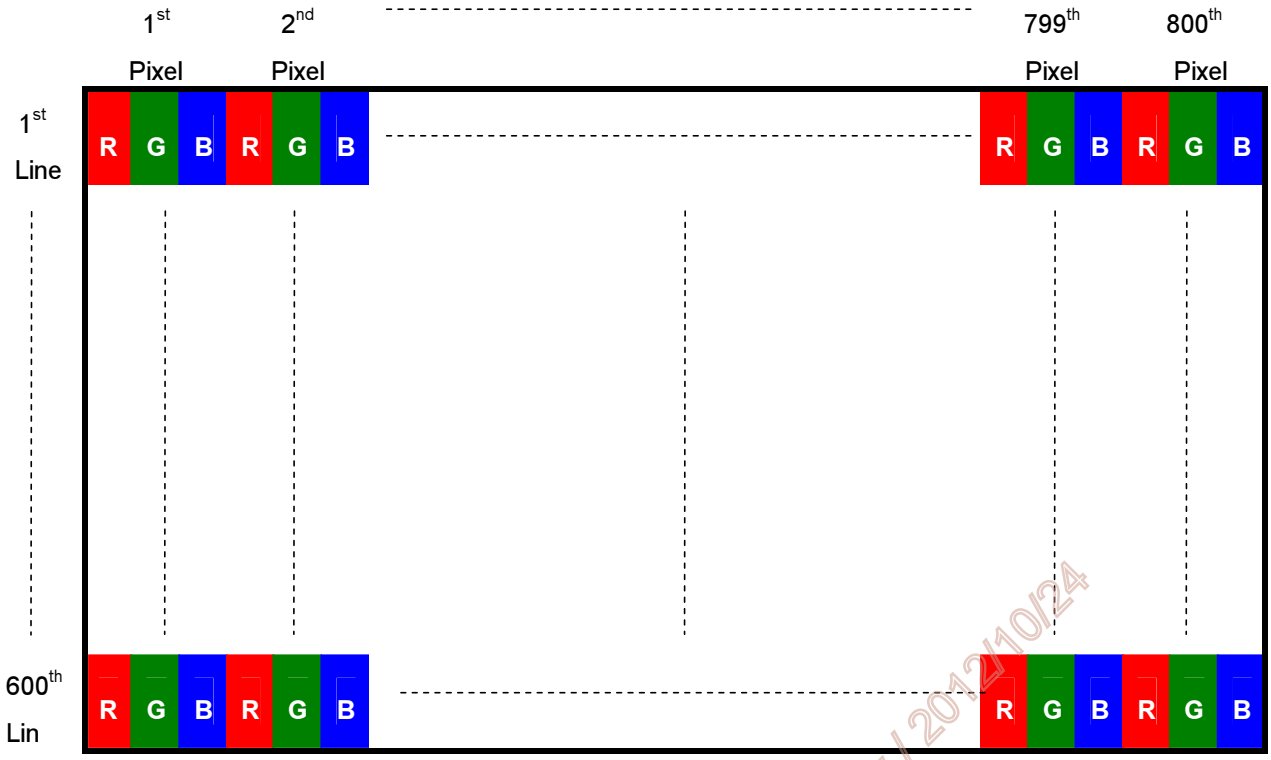
6. Signal Characteristics

6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.



6.2 Scanning Direction

The following figures show the image seen from the front view. The arrow indicates the direction of scan.

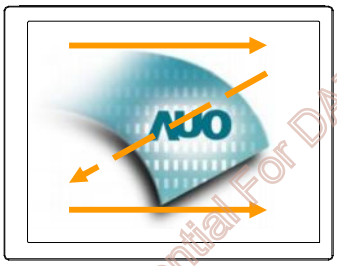


Fig. 1 Normal scan (Pin19, RSV = Low or NC)

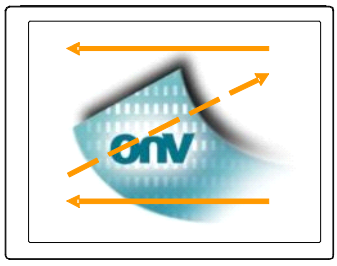


Fig. 2 Reverse scan (Pin19, RSV = High or VDD)

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6.3 TFT-LCD Interface Signal Description

The module using a LVDS receiver embaded in AUO's ASIC. LVDS is a differential signal technology for LCD interface and a high-speed data transfer device.

Input Signal Interface		
Pin No.	**Symbol**	**Description**
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	GND	Ground
4	SEL68	6/ 8bits LVDS data input selection [H: 8bits L/NC: 6bit]
5	RIN0-	LVDS receiver signal channel 0
6	RIN0+	LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)
7	GND	Ground
8	RIN1-	LVDS receiver signal channel 1
9	RIN1+	LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)
10	GND	Ground
11	RIN2-	LVDS receiver signal channel 2
12	RIN2+	LVDS Differential Data Input (B2, B3, B4, B5, HS, VS, DE)
13	GND	Ground
14	CLKIN-	LVDS receiver signal clock
15	CLKIN+	
16	GND	Ground
17	RIN3-	LVDS receiver signal channel 3, NC for 6 bit LVDS Input
18	RIN3+	LVDS Differential Data Input (R6, R7, G6, G7, B6, B7, RSV)
19	RSV	Reverse Scan Function [H: Enable; L/NC: Disable]
20	NC/GND	Reserved for AUO internal test. Please treat it as NC.

Note 1: Input Signals shall be in low status when VDD is off.
Note 2: High stands for "3.3V", Low stands for "0V", NC stands for "No Connection".
Note 3: RSV stands for "Reserved".

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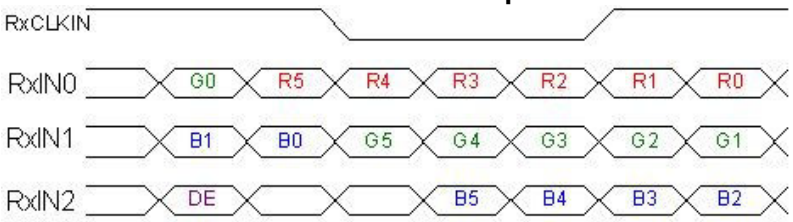
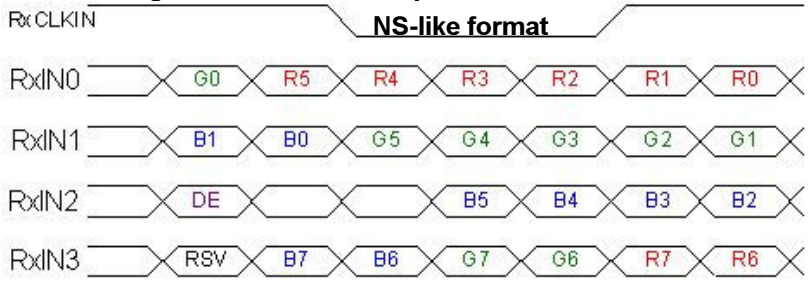
6.4 The Input Data Format

6.4.1 SEL68

SEL68 =“Low” or “NC” for 6 bits LVDS Input



SEL68 = “High” for 8 bits LVDS Input



Note1: Please follow PSWG.
Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

Signal Name	Description	
+RED7(R7) +RED6(R6) +RED5(R5) +RED4(R4) +RED3(R3) +RED2(R2) +RED1(R1) +RED0(R0)	Red Data 7(MSB 8bit) Red Data 6 Red Data 5 (MSB 6Bit) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel’s brightness data consists of these 6/8 bits pixel data.
+GREEN7(G7) +GREEN6(G6) +GREEN5(G5) +GREEN4(G4) +GREEN3(G3) +GREEN2(G2) +GREEN1(G1) +GREEN0(G0)	Green Data 7(MSB 8bit) Green Data 6 Green Data 5 (MSB 6Bit) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB)	Green-pixel Data Each green pixel’s brightness data consists of these 6/8 bits pixel data.
+BLUE7(B7) +BLUE6(B6) +BLUE5(B5) +BLUE4(B4) +BLUE3(B3) +BLUE2(B2) +BLUE1(B1) +BLUE0(B0)	Blue Data 7(MSB 8bit) Blue Data 6 Blue Data 5 (MSB 6Bit) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel’s brightness data consists of these 6/8 bits pixel data.
CLK	Data Clock	The typical frequency is 40MHz. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of CLK. When the signal is high, the pixel data shall be valid to be displayed.

Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

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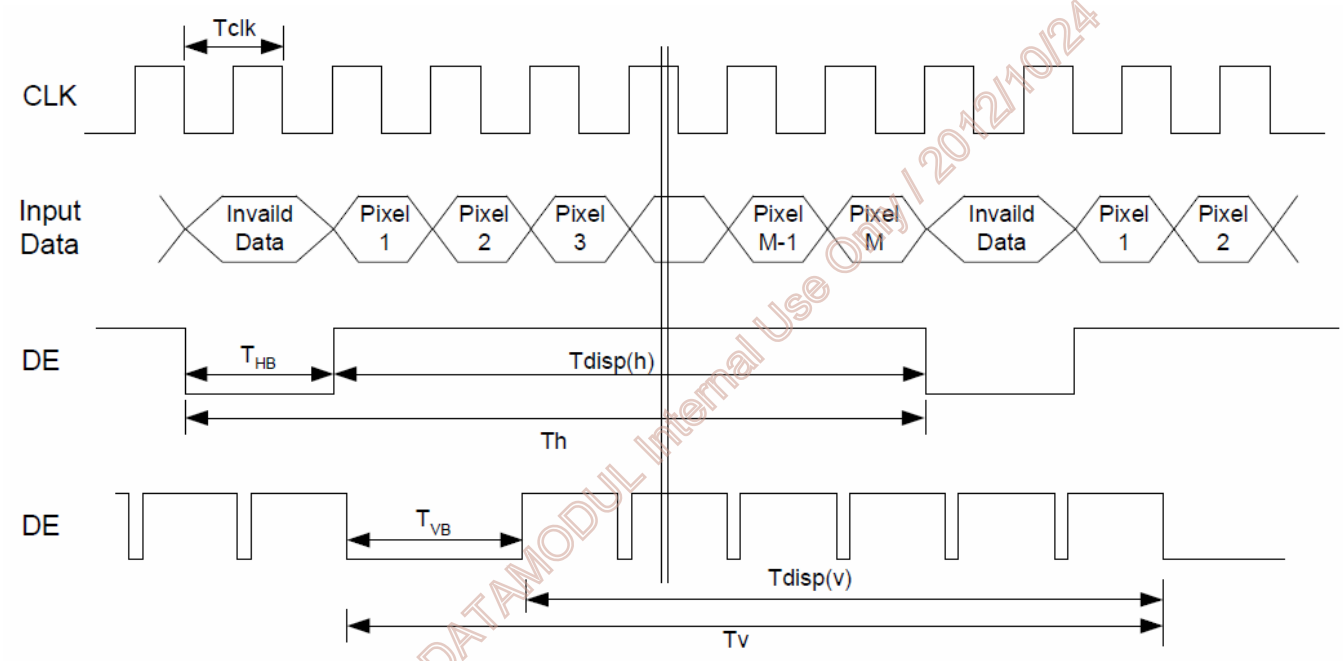
6.5 TFT-LCD Interface Timing

6.5.1 Timing Characteristics

Signal		Symbol	Min.	Typ.	Max.	Unit
Clock Frequency		1/ T_{Clock}	34	40	48.3	MHz
Vertical Section	Period	T_V	608	628	1024	T_{Line}
	Active	T_{VD}	--	600	--	
	Blanking	T_{VB}	8	28	423	
Horizontal Section	Period	T_H	960	1056	1060	T_{Clock}
	Active	T_{HD}	--	800	--	
	Blanking	T_{HB}	220	256	440	

Note 1: Frame rate is 60 Hz.
Note 2: DE mode.

6.5.2 Input Timing Diagram



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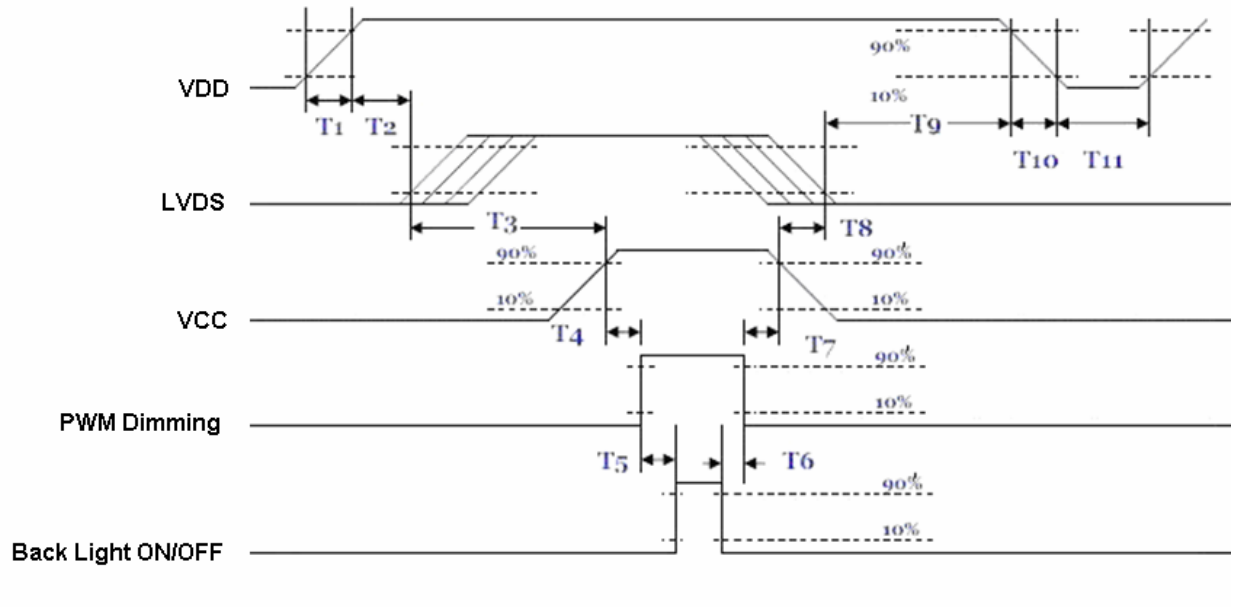
6.6 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	175	-	-	[ms]
T4	10	-	-	[ms]
T5	10	-	-	[ms]
T6	0	-	-	[ms]
T7	10	-	-	[ms]
T8	100	-	-	[ms]
T9	0	16	50	[ms]
T10	-	-	10	[ms]
T11	1000	-	-	[ms]

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

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7. Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT-LCD Signal (CN1): LCD Connector

Connector Name / Designation	Signal Connector
Manufacturer	STM or compatible
Connector Model Number	MSB240420-E or compatible
Adaptable Plug	P240420 or compatible

Pin No.	Symbol	Pin No.	Symbol
1	VDD	2	VDD
3	GND	4	SEL68
5	RIN0-	6	RIN0+
7	GND	8	RIN1-
9	RIN1+	10	GND
11	RIN2-	12	RIN2+
13	GND	14	CLKIN-
15	CLKIN+	16	GND
17	RIN3-	18	RIN3+
19	RSV	20	NC/GND

7.2 LED Backlight Unit (CN2): Driver Connector

Connector Name / Designation	Lamp Connector
Manufacturer	ENTERY or compatible
Connector Model Number	3808K-F05N-02R or compatible
Mating Model Number	H208K–P05N-02B or compatible

Pin No.	symbol	description
Pin1	VCC	12V input
Pin2	GND	GND
Pin3	On/OFF	5V-ON,0V-OFF
Pin4	Dimming	PWM
Pin5	NA	

7.3 LED Backlight Unit (CN4): Light bar Connector

Connector Name / Designation	Lamp Connector
Manufacturer	ENTERY or compatible
Connector Model Number	H208K–P03N-02B or compatible
Mating Model Number(CN3)	3808K-F03N-02R or compatible

Pin No.	symbol	description	Color
Pin1	H	LED anode	Red
Pin2	L	LED cathode	White
Pin3	L	LED cathode	Black

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8. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	40 °C, 90%RH, 300 hours	
High Temperature Operation	85 °C, 300 hours	
Low Temperature Operation	-30 °C, 300 hours	
Hot Storage	85 °C, 300 hours	
Cold Storage	-30 °C, 300 hours	
Thermal Shock Test	-20 °C / 30 min, 60 °C / 30 min, 100cycles, 40 °C minimun ramp rate	
Hot Start Test	85 °C / 1Hr min. power on/off per 5 minutes, 5 times	
Cold Start Test	-30 °C / 1Hr min. power on/off per 5 minutes, 5 times	
Shock Test (Non-Operating)	50G, 20ms, Half-sine wave, (±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, Sine wave) 30 mins/axis, 3 direction (X, Y, Z)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
ESD	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point Air Discharge: ± 15KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point	Note 1
EMI	30-230 MHz, limit 40 dBu V/m, 230-1000 MHz, limit 47 dBu V/m	

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost Self-recoverable. No hardware failures.

Note2:

- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module capability.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.

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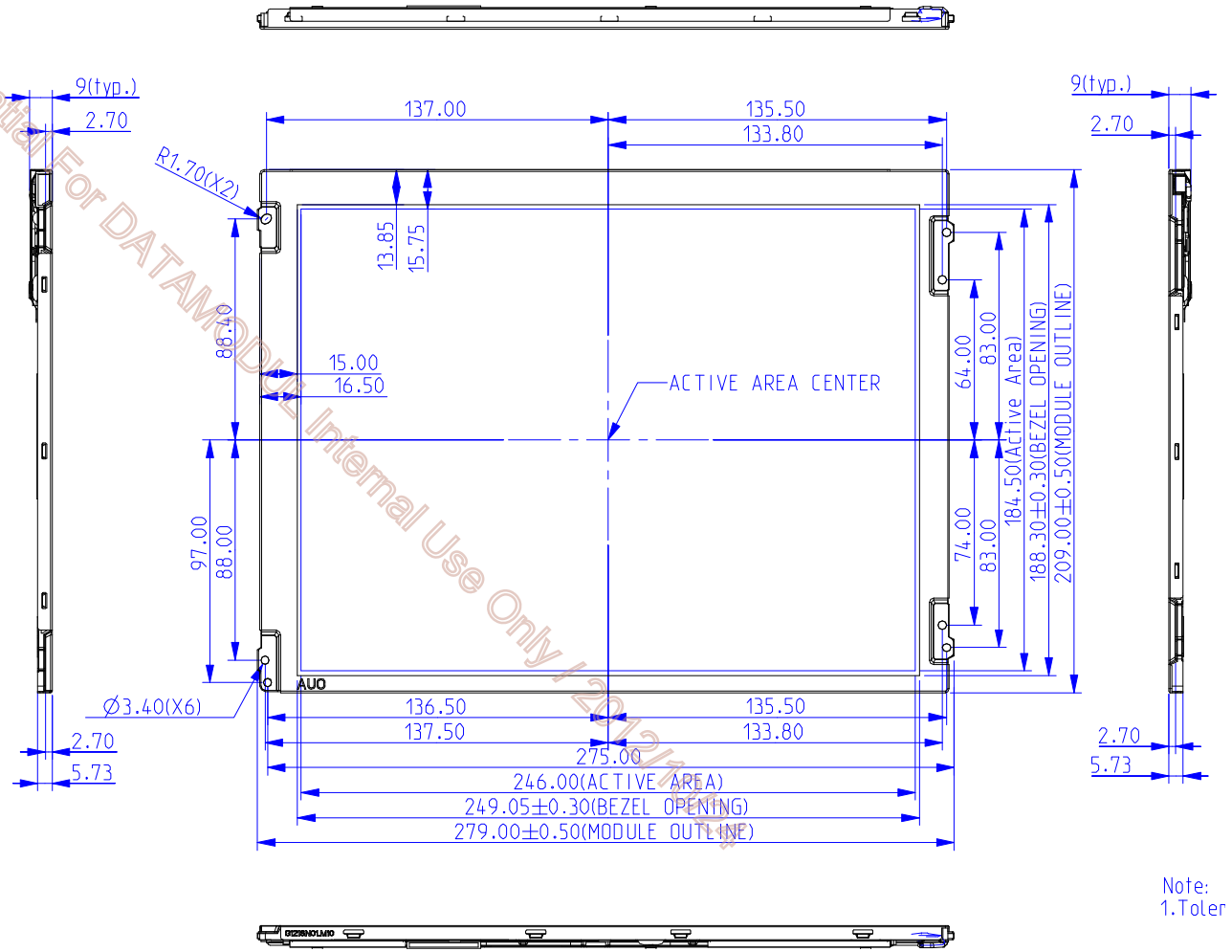
9. Mechanical Characteristics

9.1 LCM Outline Dimension (Front View)



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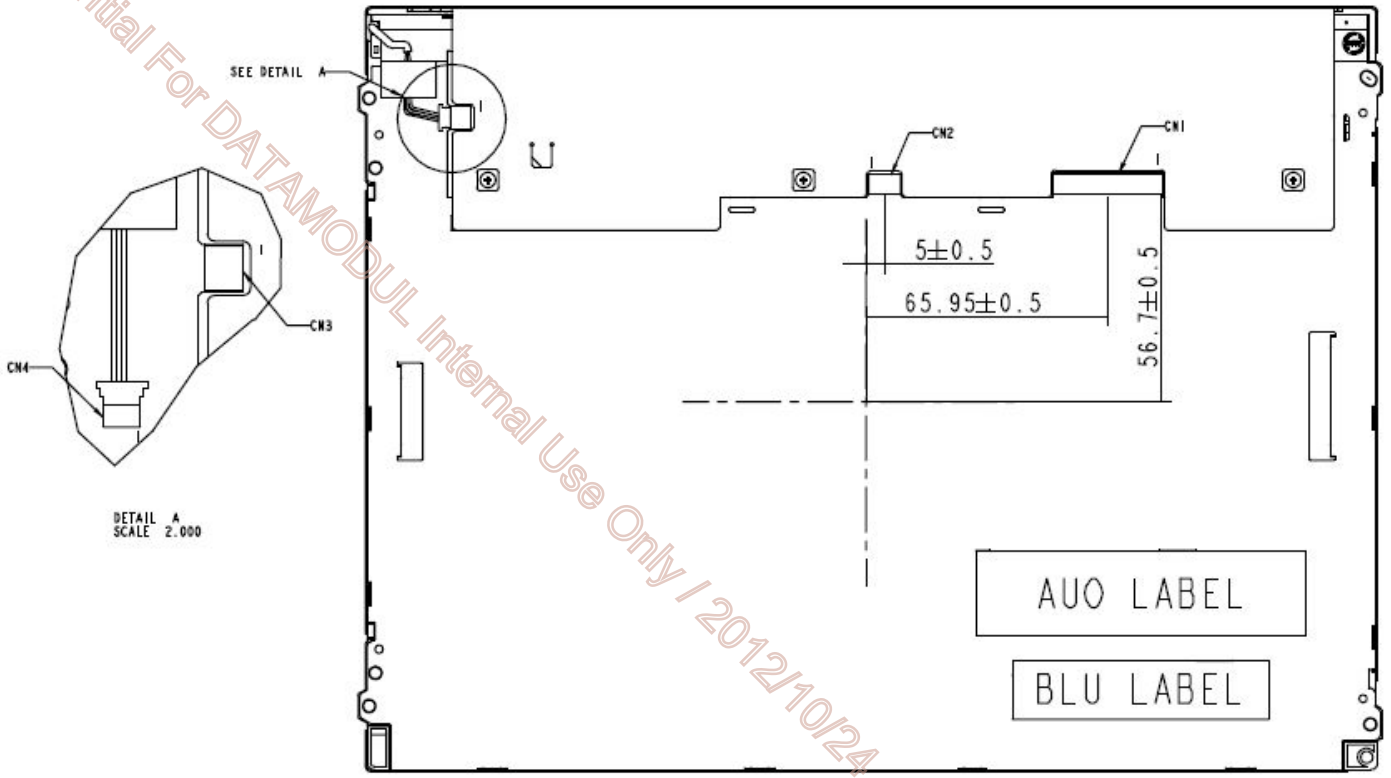
9.2 LCM Outline Dimension (Rear View)



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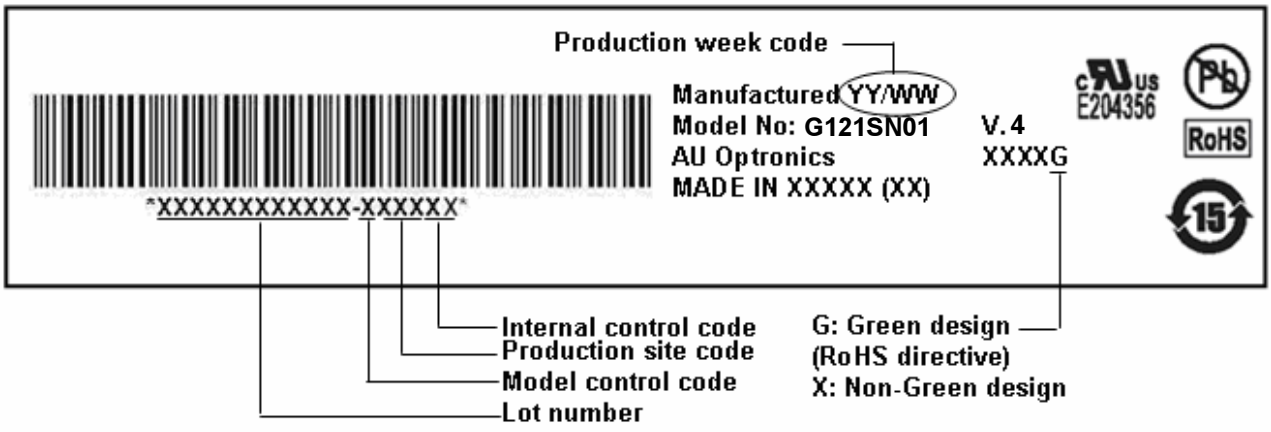
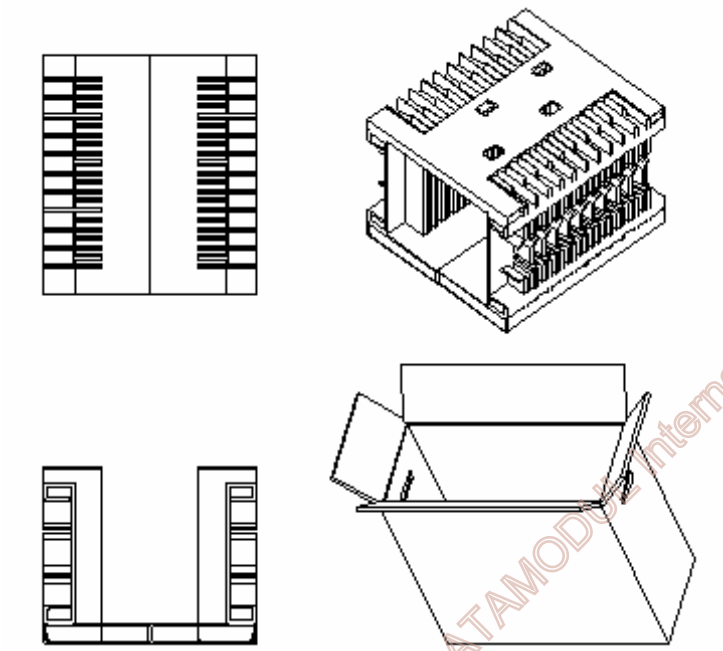
10. Label and Packaging

10.1 Shipping Label (on the rear side of TFT-LCD display)



10.2 Carton Package



Note:
1. Max. Capacity: 20pcs LCD Modules / per carton
2. Max. Weight: 14.8 kg / per carton
3. The outside dimension of carton is 570(L) mm x 320(W) mm x 420(H) mm

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11 Safety

11.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

11.2 Materials

11.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

11.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

11.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

11.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

UL 1950, First Edition	U.S.A. Information Technology Equipment

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Specification

AST/ATP Series
Revision 11

Version March 23, 2010

Table of Contents

1. Product Specifications 3
1-1. Product Applicable 3
1-2. Structure 3
1-3. Environmental Specifications 3
1-4. Mechanical Characteristics 3
1-5. Electrical Characteristics 3
1-6. Appearance 4
2. Testing Regulation 5
2-1. Testing Regulation 5
2-2. Environmental Specifications 5
2-3. Mechanical Characteristics 5
2-4. Electrical Characteristics 6
2-5. Appearance 6
3. Reliability Condition 7
3-1. Temperature Condition 7
4. Recommended Connector 7
4-1. Recommended Connector 7
5. Handling Notes 8
5-1. Precautions 8
5-2. Handling Notes 8
5-3. Construction Notes 8
5-4. Electrical & Software Notice 8
5-5. Mounting Notes 9
6. Warranty 10
6-1. Warranty Period 10
6-2. Warranty Target 10
6-3. Warranty Exceptions 10
6-4. Tools 10
6-5. Changes 10
7. Revision history 11

1. Product Specifications

1-1. Product Applicable

§ This specification is applied to the analog resistive touchscreen: ATP/AST Series.

1-2. Structure

§ Dimensions, structure, and shape are referred on the drawing attached.

1-3. Environmental Specifications

Specification	Value
Operating Temperature	-20°C to 70°C (no condensation)
Operating Humidity	-20°C to 60°C Less than 90%RH (no condensation) Exceeding 60°C 133.8g/m^3 (no condensation)
Storage Temperature	-40°C to 80°C (no condensation)
Storage Humidity	-40°C to 60°C Less than 95%RH (no condensation) Exceeding 60°C 142.9g/m^3 (no condensation)
Chemical Resistance (top surface)	Toluene, Tricholoroethylene, Athetone, Alcohol, Gasoline, Machine Oil, Ammonia, Glass Cleaner, Mayonnaise, Ketchup, Wine, Salad Oil, Vinegar, Lipstick, etc.

1-4. Mechanical Characteristics

Specification	Value	
Activation Force	0.05N to 0.8N	
Operating Life	Input (finger)	10,000,000 hits
	Character Input (pen)	100,000 characters
Light Transmittance	Over 80% (typical value at full wavelength)	
Surface Hardness	Over 2H (by JIS pencil hardness)	

1-5. Electrical Characteristics

Specification	Value	
Maximum Voltage	DC6V	
Maximum Current	Top Electrode	100mA
	Bottom Electrode	100mA
	Between the Top and Bottom	0.5mA
Linearity	Under ±2% (Under ±1% (typical value))	
Terminal Resistance	Top Electrode	Less than 1kΩ
	Bottom Electrode	Less than 1kΩ
Insulation Resistance	Neighboring Terminals	Over 20MΩ at 25V
	Active Area Electrodes	Over 20MΩ at 25V
Chattering	Less than 10msec at ON/OFF.	

1-6. Appearance

§ Scratch, dust (W = width, L = length, D = average diameter = (longest + shortest) /2)

Item	Width (mm)	Length (mm)	Acceptable Numbers	Total
Linear(Scratch/Dust) Over 0.1mm in diameter refer to the Circular.	0.1≥W>0.05	4≥L	1pcs in ϕ30mm	Within 5pcs /panel
	0.05≥W>0.03	10≥L	2pcs in ϕ20mm	
	0.03≥W	20≥L	Acceptable	
Circular (Scratch/Dust)	0.4≥D>0.3 *1		1pcs in viewing area *1	
	0.3≥D>0.2		2pcs in ϕ30mm	
	0.2≥D		Acceptable	

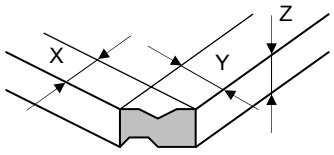
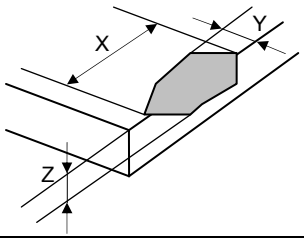
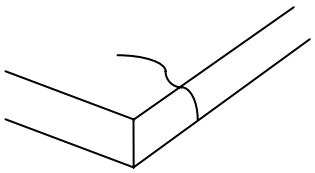
Applied only in the Active Area. Scratches or dusts in the outside of the Active Area are acceptable unless the electrical characteristics are affected.

*1 Applied to the size of 14 inches or more.

§ Dirt

Acceptable if not noticeable on a black mat.

§ Tip, crack (t = glass thickness) (applicable only for the glass)

Item	Size (mm)			Acceptable Numbers
Corner		X	≤3	2pcs /panel
		Y	≤3	
		Z	≤t	
Side		X	≤5	2pcs /side
		Y	≤3	
		Z	≤t	
Crack				Not acceptable

2. Testing Regulation

2-1. Testing Regulation

§ If the regulation is not specified, the test is performed under the supplier's regulation.

§ Tests are performed under the room temperature unless specified. The room temperature is referred as follows:

Temperature: 20°C±5°C
Humidity: 65%±10%RH

2-2. Environmental Specifications

§ Chemical Resistance Test

Condition: Tested after leaving the chemical on the surface for 12 hours being wiped off by cloth.

Judgement: Must be no effect in appearance.

2-3. Mechanical Characteristics

§ Activation Force Test

Condition: Measured by depressing the point between the dots to the conduction by the testing rod (Figure 1).

Judgement: Must satisfy the specification.

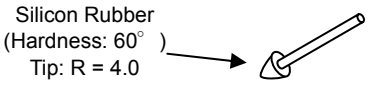


Figure 1. Testing rod 1

§ Operating Life Test (Finger)

Condition: Testing rod: Refer to Figure 1
Voltage: DC5V
Load: 3N
Cycle: 2 hits/sec

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.

§ Operating Life Test (Pen)

Condition: Testing rod: Refer to Figure 2
Voltage: DC5V
Load: 2.5N
Input size: 10 x 10 mm
Input character: A to Z/minute

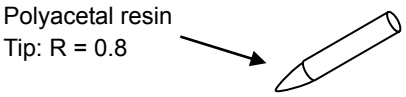


Figure 2. Testing rod 2

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.

2-4. Electrical Characteristics

§ Terminal Resistance Test

Condition: Top and bottom electrodes are measured at the terminal.

Judgement: Must satisfy the specification.

§ Insulation Resistance Test

Neighboring Terminals: Measured by applying the reference voltage to the terminals

Active Area Electrodes: Measured by applying the reference voltage to the top and bottom electrodes.

Judgement: Must satisfy the specification.

2-5. Appearance

§ Appearance Test

Condition: Tested by an examiner with over 1.0 eyesight at 30cm away from the product under the transmittable light at over 60° the surface of the product.

Judgement: Must satisfy the specification.

3. Reliability Condition

3-1. Temperature Condition

§ Temperature Condition Test

Following test are performed in the condition with no dew condensation:

Cold Test: Tested after leaving the parts in -40°C±3°C for 240 hours and in the room temperature for 2 hours.

Heat Test: Tested after leaving the parts in 80°C±3°C for 240 hours and in the room temperature for 2 hours.

Humidity Test: Tested after leaving the parts in the temperature 60°C±3°C, humidity 90 to 95% for 240 hours and in the room temperature for 2 hours.

Cycle Test: Tested after 5 cycles of leaving the parts in the temperature -30°C±3°C for 1 hour and in the room temperature for 0.5 hours, then leaving the parts in the temperature 70°C±3°C for 1 hour and in the room temperature for 0.5 hours.

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.
Appearance:	Must satisfy the specification.

4. Recommended Connector

4-1. Recommended Connector

Part No.	Pins	Pitch
KCA-K4R	4 pin Double-sided	1.25mm

5. Handling Notes

5-1. Precautions

§ This product is intended for use in standard applications (computers, office automation, and other office equipment, industrial, communications, and measurement equipment, personal and household devices, etc.) Please avoid using this product for special applications where failure or abnormal operation may directly affect human lives, or cause physical injury or property damage, or where extremely high levels of reliability are required (such as aerospace systems, vehicle operating control, atomic energy controls, medical devices for life support, etc.).

5-2. Handling Notes

§ Do not depress or scratch the product with any object with a sharp edge or end.

§ Do not forcibly bend or fold the product.

§ When the product is stored, make sure it is packed in a packing box and stored in a storage temperature range, eliminating any outside load.

§ Do not use or store the product under a condition where the product will be exposed to water, organic solution or acid.

§ Do not use the product under the direct sunlight.

§ Do not disassemble the product.

§ When you handle the product, Hold the product by its body. Do not hold by the tail.

§ Clean the product with a soft cloth or a soft cloth with neutral detergent or alcohol. When contaminated by chemicals, wipe them off immediately with caution not to cause injury to human body.

§ The edge of the glass is not rounded and may cause injury.

5-3. Construction Notes

§ The environmental specifications, mechanical characteristics, and electrical characteristics are only applied to the Active Area.

§ Do not use the touchscreen when the condensation occurs. The condensation inside of the touchscreen is a natural phenomenon and should disappear after the touchscreen is warmed up.

5-4. Electrical & Software Notice

The best performance can be obtained when used with the original analog resistive touchscreen controller, “TSC-10” Series. If the touchscreen controller or controller software is to be developed by the customer, please note the following:

§ There is a contact resistance between the top and bottom electrodes and it changes by the pressure of a finger or a pen. The data must be read after the contact resistance becomes stabilized.

§ The terminal resistance of the analog resistive touchscreen varies by the individual, time, and environment. The controller software must have the calibration function to adjust the input position and the display position.

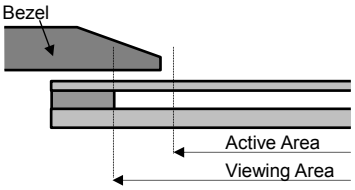
§ The analog resistive touchscreen outputs 2 point input as 1 point in between the 2 points. The controller software must not be designed to have the 2 point input function.

§ For drawing applications, the line may be intermittent when the pen comes on the dot spacers. A software compensation is needed.

5-5. Mounting Notes

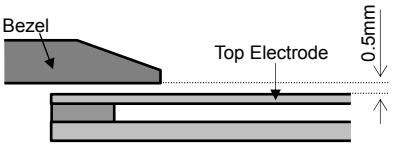
§ Bezel Edge

Bezel edge must be positioned in the area between the Active Area and the Viewing Area. The bezel may press the touchscreen and cause input if the edge enters the Active Area.



§ Gap between the Bezel and Touchscreen

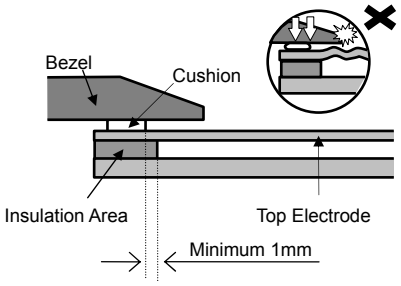
A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected input if the gap is too narrow.



§ Cushion

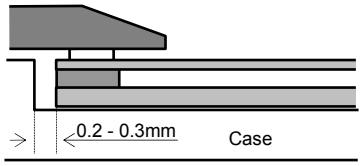
If a cushion is used between the bezel and the top electrode, the cushion must be free enough to absorb the expansion and contraction difference between the bezel and the top electrode. If the cushion is squashed too hard, the expansion and the contraction difference may cause the distortion to the top electrode.

The cushion must be positioned more than 1mm outward from an inside of the insulation area. (Please refer to right figure)



§ Tolerance

There is a tolerance of 0.2 to 0.3mm for the dimensions of the touchscreen and the tail. A gap must be made to absorb the tolerance in the case and the connector.

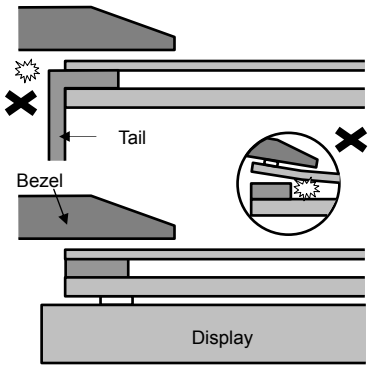


§ Tail

The tail must not be forcibly stressed or bent too hard to avoid the conduction in the insulated area and wire breaking.

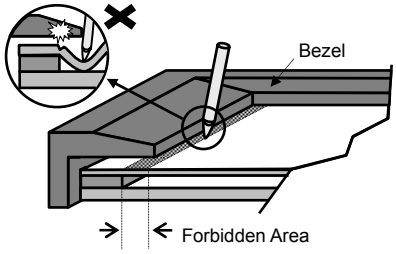
§ Mounting

Touchscreen must be held from the bottom such as the structure gluing the touchscreen onto the display. If the touchscreen is glued to the bezel, the adhesion between the top and bottom electrode is stressed and may come off.



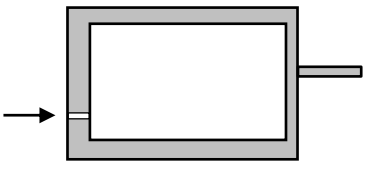
§ Forbidden Area

The area within 2mm from the insulation area is structurally week for the pressure, espcially for pen use. The film may be forcibly bent and may cause defection. This area must be protected by the bezel and input must be avoided.



§ Air Vent

Most of the touchscreens have the air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be absorbed if the lquid is accumilated near the air vent. The top electlode must not be swelled by the air pressure from inside of the case.



6. Warranty

6-1. Warranty Period

§ The warranty period is limited to 1 year from the date of shipping. The warranty for the initial defection such as appearance defection is limited to 1 month.

§ Any defected parts under proper use will be examined by the supplier and replaced by the new parts if the defection is considered to be caused by the supplier.

§ The replacement is subject to be included in the next lot.

6-2. Warranty Target

§ The warranty only covers the product itself and does not cover any damage to others caused by using this product. Onsite repair or replacement is not supported.

§ We will do our best for delivery problem and product defections, but the warranty for the production line is not covered.

§ Resistive touchscreens are structurally not repairable. All defections are subject to replacement.

6-3. Warranty Exceptions

Following conditions are not covered with the warranty and subject to charge.

§ Any malfunctions and damages during transportation and transfer by the user.

§ Any malfunctions and damages caused by a natural disaster or a fire.

§ Any malfunctions and damages caused by static electricity

§ Any malfunctions and damages caused by the failure of the associated equipment.

§ If the product is remodeled, disassembled or repaired by the user.

§ If the product is glued onto the equipment and uninstalled.

§ Any malfunctions and damages caused by an improper usage and handling against the specifications and notes.

6-4. Tools

§ To maintain the quality, the printing screens and the die-cut plates are generally limited to use up to 1 year. Reorders after 1 year from the initial order or from the last renewal are subject to the tooling charge for replacing the printing screens and the die-cut plates. Reorders for the discontinued standard parts are also subject to tooling charge.

§ All the tools, such as CAD data (except for the drawing for approval), block copies (films), printing screens, and die-cut plates are not to be provided for administrative purpose.

6-5. Changes

§ Because of the manufacturing process, changing the dimensions, circuit pattern, and the tail position requires replacing most of the tools and is subject to high tooling charge. Please be careful when ordering and approving the drawing.

§ Circuit pattern and the materials that does not affect the environmental, electrical, and mechanical characteristics such as film, glass, ink and glue are subject to change for the supplier’s reason or for improvement within the specifications.

§ Standard products are subject to change for improvement without notice.

7. Revision history

Rev1 (April 15, 1998)

Initial release

Rev2 (June 1, 1999)

The overall revision by specification review.

Rev3 (April 1, 2002)

The address in the office was changed by the move.

Rev4 (August 16, 2002)

1-4.Activation Force is changed “50g± 30g” to “0.5N±0.3”.

1-4.Light Transmission is changed 76% to 80%(TYP).

Rev5 (September 3, 2002)

1-3.Operating Temperature is changed “0°C to 60°C” to “-20°C to 70°C”.

1-3.Storing Temperature is changed “-20°C to 70°C” to “-40°C to 80°C”

1-4.Operating Life is changed “1,000,000 hits” to “10,000,000 hits”.

1-5.Linearity is changed “Under ±2%” to “Under ±1% (typical value)”.

Rev6 (June 28, 2004)

1-3.Operating Humidity is changed “Less than 90%RH (no condensation)” to “-20°C to 60°C Less than 90%RH (no condensation) Exceeding 60°C 133.8g/m^3 (no condensation)”.

1-3.Storing Humidity is changed “Less than 95%RH (no condensation)” to “-40°C to 60°C Less than 95%RH (no condensation), Exceeding 60°C 142.9g/m^3 (no condensation)”.

1-5.Maximum Voltage is changed “DC5V” to “DC6V”.

1-5.Linearity is changed “Under ±1% (typical value)” to “Under ±2% (Under ±1% (typical value))”.

Rev7 (October 15, 2004)

4-4.Electrical & Software Notice: Changed “FIT-10 series” to “TSC-10 series”.

Rev8 (April 7, 2005)

Added Item4 Recommended Connector.

Rev9 (September 6, 2005)

2-3.Mechanical Characteristics: Added Operating Life Test (Pen).

Rev10 (November 10, 2006)

The specification item name was changed.

1-3.”Storing Temperature” to “Storage Temperature”

1-3.”Storing Humidity” to “Storage Humidity”

1-4.”Operating Load” to “Activation Force”

1-4.”Light Transmissivity” to “Light Transmittance”

1-4.”Top Surface Hardness” to “Surface Hardness”

2-3.”Operating Load Test” to “Activation Force Test”

2-3.”Operating Load” to “Activation Force”

3-1.”Operationg Load” to “Activation Force”

1-4.Operating Force is changed “0.5N±0.3N” to “0.05N to 0.8N”.

1-5.Insulation Resistance is changed “Over 100MΩ at 25V” to “Over 20MΩ at 25V”.

1-6.Tip, crack: Deleted “Applied only in the Active Area. Scratches or dusts in the outside of the Active Area are acceptable unless the electrical characteristics are affected.”.

2-3. § Operating Life Test (Pen) Load: 300g to 250g

5-5. § Cushion: Added an installation position of a cushion.

7.Added Revision History.

Rev11 (March 23, 2010)

1-6. Appearance specification was revised. Characters of scratch/dust were classified into Circular and Linear. The total acceptable number of scratch/dust was added.

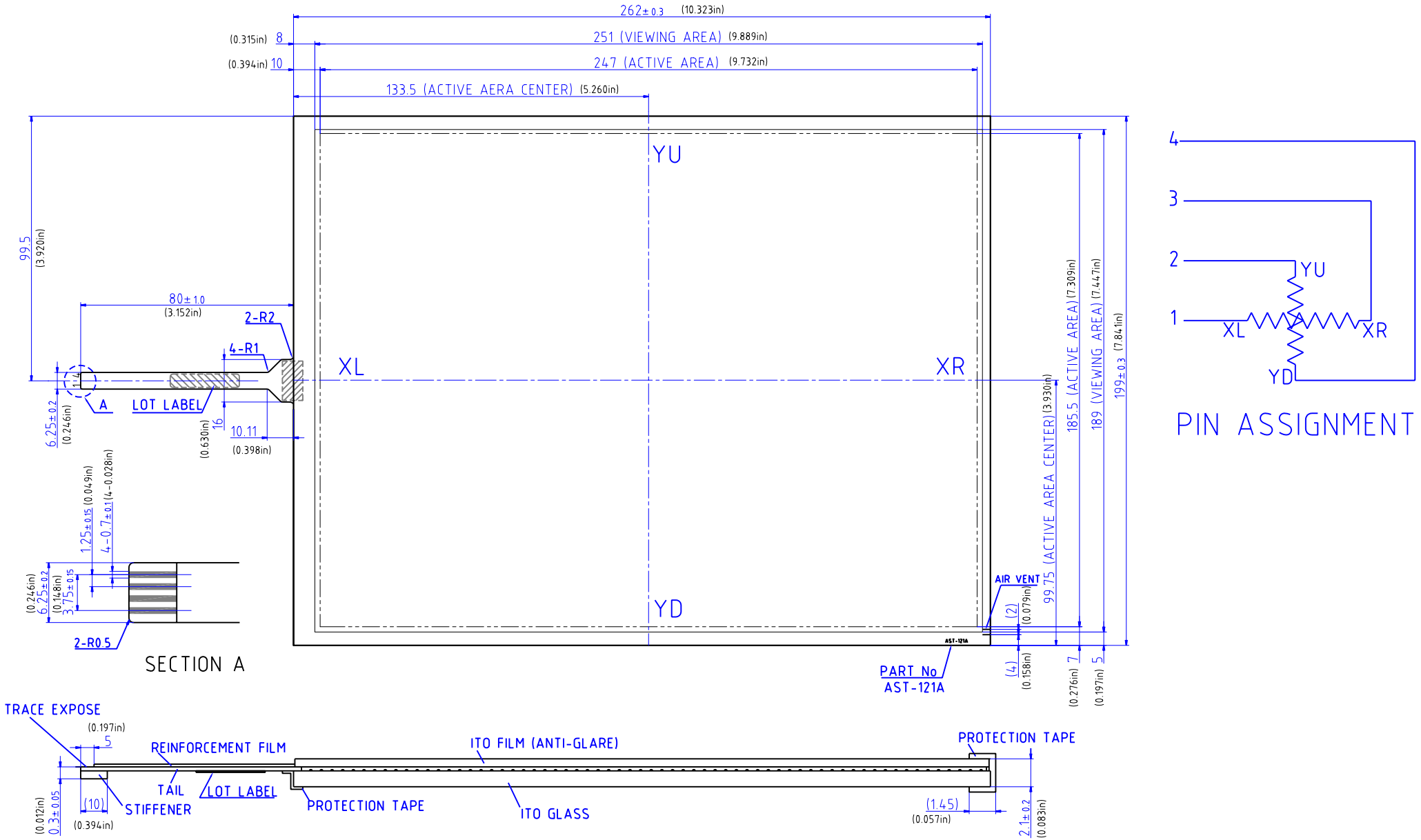
2-3. Unit of Load (g) changed to (N) to unify the unit

2-3. Operating Life Test (Finger) Activation Force, Within ±50% of the specification → Must satisfy the specification. (Clerical error was corrected)

2-3. Operating Life Test (Pen) Activation Force, Within ±50% of the specification → Must satisfy the specification. (Clerical error was corrected)

3-1. Temperature Condition Cold Test -30℃→ -40℃ (Clerical error was corrected)

3-1. Activation Force, Within ±50% of the specification. → Must satisfy the specification
(Clerical error was corrected)

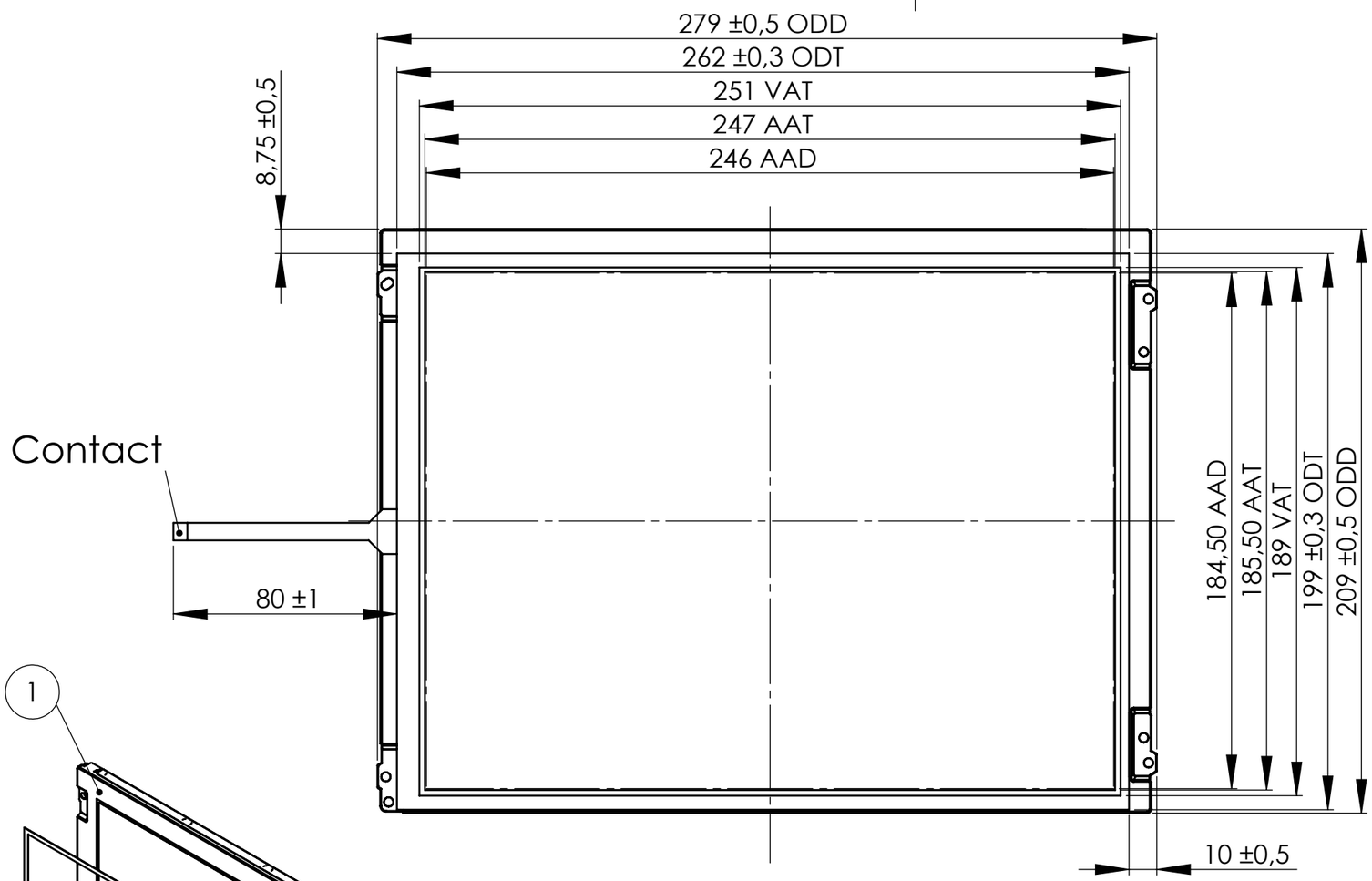


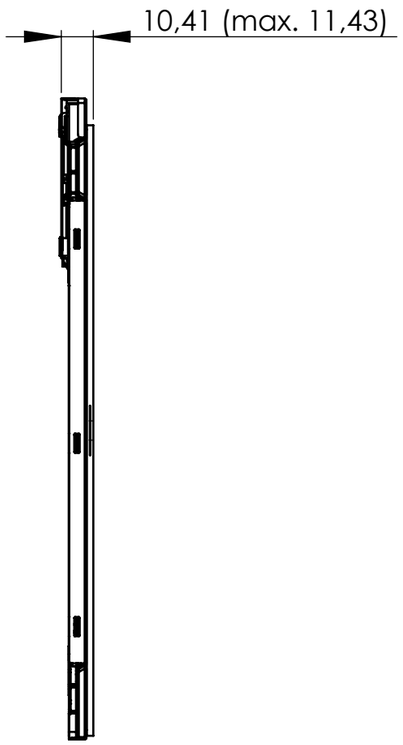
DATA MODUL

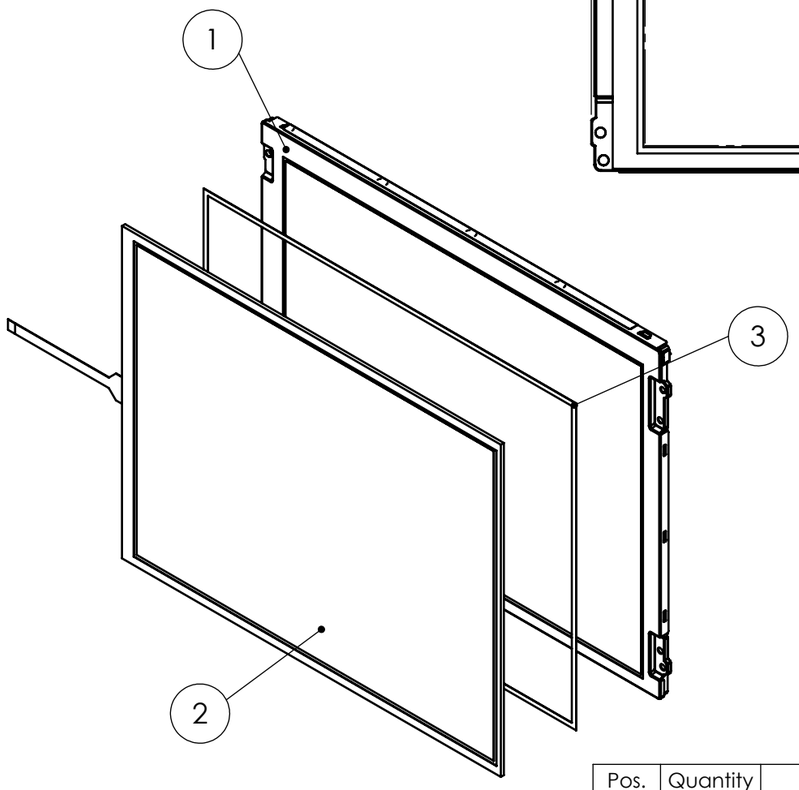
TOLERANCE=±0.5mm(0.02in)
EXCEPT WHERE INDICATED
UNIT=mm(inch)

PART No.	DATE
AST-121A080A	May 19 , 2004
TYPE STANDARD TOUCHSCREEN DIMENSIONAL DRAWING	DMC Co., Ltd.

NOT TO BE DISCLOSED TO THIRD PARTY WITHOUT PERMISSION FROM | CONRAC GMBH / Data Modul AG







M 1:3

Pos.	Quantity	File Number	Description
1	1	1009935-T	TFT-LCD MODULE 12,1"
2	1	1009860-T	Touch
3	1	1009956-T	Klebeband 3x0,13

ODD	Outline Dimension Display
ODT	Outline Dimension Touch
VAT	Viewing Area Touch
AAT	Active Area Touch
AAD	Active Area Display

This drawing is only schematic representation of the structure.
The parts to be used are defined in the ProAlpha parts list.

REV.	NO. OF CHANGES	REL.DATE	DRAWN BY	E.C.-NO.	MODIFICATION/DESCRIPTION
000		26.02.2013	Aschenbrenner	10000	Neuanlage

FINISH

CONRAC D-97990 Weikersheim

DATA MODUL D-80687 München

RELEASED: ja

PROJECT: DMO_C_

MATERIAL

DRAWING TITLE

Assembly

TFT Display 12,1" + resistive Touch

TOLERANCES DIN ISO 2768-mK

SURFACES DIN ISO 1302

DRAWING/PART NUMBER

12002655 000

FILE NUMBER: 1009957

SCALE 1:2

SIZE ISO A3

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